MINNESOTA

AND ITS FLORA.

MINNESOTA.

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BY
J. O. BARRETT,
Secretary State Forestry Association.
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The State Forestry Exhibit.

Soon after the adjournment of the legislature, 1891, Gov. W. R. Merriam appointed the following Board of World's Fair Commissioners: D. A. Monfort, St. Paul; J. La Due, Luverne; C. McC. Reeve, Minneapolis; J. J. Furlong, Austin; A. L. Ward, Fairmont; Geo. N. Lampher, Morehead. Ex-Officio—Gov. Knute Nelson, O. V. Tousley, Minneapolis, H. B. Moore, Duluth. Alternates—M. N. Leland, Wells, Thomas Kurtz, Moorehead. Said Board made L. P. Hunt, Mankato, State Superintendent. Meanwhile, the State Forestry Association voted to co-operate with a view to exhibit, recommending J. O. Barrett for its superintendent and C. L. Smith, assistant superintendent. The board having accordingly appointed them, the former, in the winter of that year, procured in Kenabec county, the nine typical trunk trees, with smaller varieties for rustic work, for the grand colonnade of the National Forestry Building; the three standards being white pine, rock elm, white oak, each ranging from 16 to 20 inches diameter at the base and 25 feet long, and their supports—butternut, black ash (Pine Co.), white maple, basswood, yellow birch, red oak, each same length and 9 to 12 inches.

Early in the fall of '92 he penetrated into the northern woods, and procured, in Aitkin county, the main body of the following tree sections (duplicated) of different sizes to illustrate stages of growth: White Maple, Acer Dasycarpum; Hard or Sugar Maple, with "Bird's Eye," A. Saccharinum; Swamp White Oak, Quercus Bicolor; Red Oak, Q. Rubra, donated by E. A. Hanson, Aitkin; White Ash, Fraxinus Americana; Black Ash, Sambucifolia; White Waluut (Butternut), Juglans Cinerea; Red Cherry, Prunus Pennsylvaniana; Rock Elm, Ulmus Racemosa; Water Elm; Red Cedar, Juniperus Virginiana, donated by R. M. Bond, Aitkin; Hornbeam, Osbrya Fulva; Basswood, Tilia Americana; Balm of Gilead, Populus Candicans; White Poplar, P. Alba; American Aspen, P. Tremuloides; Large Toothed Poplar, P. Grandidentata; White Pine, Pinus Strobus; Yellow Pine, P. Mitis; Norway or Red Pine (Timber and Pig Iron), P. Resinosa; Tamarac, Larix Americana; White Spruce, Abies Alba; Black Spruce, A. Nigra; Balsam Fir, Balsamea; White Cedar or Arbor Vitæ, Thuja Occidentalis; Yellow Birch, Betula Excelsa; White Birch, Betula Alba; Hackberry, Celtis Occidentalis; Diamond Willow, Larix Cordata; the Gnarled White Birch, gushing with water from its unique crevices, as if haunted by the Nymphs and Naiads, found on the west side of the Mississippi one hundred miles from Aitkin, near Itaska county.

Other tree sections subsequently added are the Jack Pine and the Black Birch, Betula Lenta, donated by Hon. W. P. Allen, representing the C. N. Nelson Lumber Co., Cloquet, Carlton county; European Larch, Larix Europœa, planted by L. B Hodges, 1873, Morris, Stevens county; Black Walnut, Juglans Nigra, and Black Oak, Quercus Tinctoria, by John Iverson, Rushford, Fillmore county; Ash Leaved Maple or Box Elder, Negundo Aceroides, planted in 1858, Minneapolis, Hennepin county; Black Cherry, Ceracis Virginia, donated by C. L Smith, planted near Lake Minnetonka; Shellbark Hickory, Carya Alba, planted by A. K. Cooper, Winona, Winona county; Pignut Hickory, C. Porcina, Lake Minnetonka; Cottonwood, Populus Monilifera, by Hoyt Devlin, planted in 1855, Minneapolis; White Willow, Larix Candida, planted in 1885, Minneapolis; White Elm, Ulmus Americana and Red Elm, U. Fulva, planted in 1873, donated by C. L. Smith; Silver Leaf Poplar. Abele, limb of, donated by J. T. Grimes, planted in 1863; Green Ash, Fraxinus Viridis, Lake Minnetonka; Black Jack Oak, Quercus Nigra, White Bear Lake, Ramsey county.

Scouring the country on a radius of twenty miles from the Twin Cities, Mr. Smith collected leaves (pressed) of the above named trees, young seedlings of the same, five or more species with varieties of ferns, Sumac (coloring), Witch and Nut Hazel, High and Low Bush Cranberry, Honeysuckle, Osier, Wild Plum; of vines, the Virginia Creeper, Bittersweet, Frost Grape, Moonseed; such medicinal plants as Prickly Ash, Indian Turnip, Spignut, Genseng, etc. From the wild woods were also brought in the Trailing Juniper, mosses, supplements of timber seedlings, flowering shrubs, clusters of blueberries, snowberries, pitcher plants, etc.

In our collection are beautiful photographs of lawns and wooded retreats, and wild and cultivated ferns, mosses and flowers, furnished by Mrs. A. T. Stebbins, Rochester, the lady who has been indefatigable in her efforts as chairman of the Boards of Agriculture and Forestry under the Women's Auxiliary to the World's Fair; logging and saw mill views, and water-landscape pencillings, by different artists; plant selections from the Jewell Nursery, Lake City, from the Experiment Station at St. Anthony Park, from the Floral Gardens of R. J. Mendenhall, Minneapolis, and other sources. Our acknowledgments are also due to the Hennepin Paper Company, Little Falls, procured by M. M. Williams, Esq., of that city, for the miniature "Pulp House," illustrative of the architectural uses of woodpulp; to McLaughlin & Burfening, Anoka, for their pretty stair newel, and to lumbermen and wood manufacturers for their much appreciated donations. The thousand or more things in the Minnesota Forestry Exhibit are hereby "respectfully submitted."

AUTHOR.

MINNESOTA AND ITS FLORA.

Minnesota lies mid-continental in the great basin of North America, central between the Gulf of Mexico and the Arctic ocean, and between the Atlantic and Pacific oceans, being about a thousand miles from each of these grand bodies of water. It extends to the 49 degree north latitude, and south to 43 degrees 30 minutes, and is embraced between the 90 and 97 degree west longitude. It is 380 miles long and averages 220 miles wide, and covers an area of 84,287 square miles.

TOPOGRAPHIC FEATURES.

Of the topographic features of Minnesota, Prof. Warren Upham, assistant of our State Geologist, Prof. N. H. Winchell, says "It may be briefly summed up for its western three-quarters, as being moderately undulating, sometimes nearly flat, but occasionally hilly expanse, gradually descending from the Coteau des Prairies and from the Leaf Hills respectively about 2,000 and 1,700 feet above the sea, to half this height, or from 1,000 to 800 feet, in the long flat basin of the Mississippi from St. Cloud to Minneapolis. The only exception to this moderately undulating or rolling and rarely hilly contour, are the southeast part of the State, where the Mississippi river and its tributaries are enclosed by bluffs from 200 to 600 feet high, and the northwest shore of Lake Superior and the part of the State lying north of this lake and east of Vermillion Lake. A very cold rocky highland rises from 400 to 800 feet above Lake Superior, within from one to five miles back from its shore line, all along the distance of 150 miles from Duluth to Pigeon Point, the most eastern extremity of Minnesota; while farther north are many hill ranges, 200 to 500 feet higher, mostly trending from northeast to southwest or from east to west."

ELEVATION.

Prof. Winchell estimates the average elevation of the entire State to be approximately 1,275 feet above the sea. Its continental watershed within the great valley of the Mississippi and Red River of the North, is the Mesaba (iron) Range which exceeds 200 feet above the sea.

SOIL.

For the larger part the soil, mainly characterizing the prairie real, consists of glacial drift, with a well-balanced percentage of clay and sand. Usually infrequent are gravel beds and boulders. The centuries have overlapped this great deposit from diverse formations of granite and gneiss, sandstone, limestone and shales, with the decay of vegetable and animal life, giving us a rich black soil on the glacial areas, having an average depth of two feet, and containing an inexhaustible supply of the most important agricultural constituents, such as soluble silica, lime, potash, soda, phosphoric acid, and vegetable humus. Our more sandy tracts, lying mainly to the east, where our native forests have long been manufacturing a soil, are generally fertile. Those of the woodland meadows are very superior. Our vast alluvial bot om lands, built Nile-like by ages of deposit from overflowing waters, have a soil ranging from two to six feet, usually with a substratum of clay that economizes the moisture.

THE PRAIRIE LANDS.

What is known as the prairie covers in Minnesota about one-third of the State. It is an expanse of the drift period, lying west and south of the great belt of woods. It is the extension eastward of the Great Plains that expand to Lake Winnipeg in Manitoba, afar to the foot-hills of the Rockies and south to the Gulf of Mexico, cut by the Red river of the North, the Father of Waters and its tributaries.

WOODY THREADS.

It is not correct to say of the prairie that it is naturally treeless. On the shores of its streams and lakes, and even where such have become extinct, are woody threads, demarking water boundaries, living testimonials of a once interminable forestation of the Great Plains that in the ages gone were more blessed than now with rain. These sylvan remains

"Lend enchantment to the view,"

and are we improving it with groups and walls of trees to re-Eden-ize the new Northwest.

THE FOREST LANDS.

Two-thirds of Minnesota is a natural forest country, extending nearly the entire length of the State, shaped somewhat like a flat-iron with its point to the south in Blue Earth County, and its base at the international line between the United States and the British Possessions, following the Rainy Lake River and the southern and western shore of the Lake of the Woods for a distance of over 150 miles.

THE GREAT CONIFEROUS DISTRICT.

The elevated and broken region north of latitude 46 degrees, and east of the meridian of the outlet of Red Lake, including an

area of 21,000 square miles, is the lumber territory of Minnesota, where the prevailing wood is white and red pines and other coniferæ, intermingled with a considerable proportion of hard woods. The alluvial bottoms of this district, sprinkled with beautiful swells, more especially on the northern branches of the Mississippi, support a heavy growth of basswood, elm, aspen, butternut, ash, birch, maple, balsam, fir, spruce, tamarac in the swamps, arbor vitœ, white and red oak. The sugar maple is immense, found scattered in clumps on the higher elevations and along the trough of the Red River Valley, reaching its northern limit beyond the 49 degree parallel, on the southern watershed of Lake Winnepeg. The white and yellow birches are quite abundant along the tributaries of the upper Mississippi and rivers that flow into Lake Superior.

THE PINE ZONE.

The principal pine forests, constituting one of the main sources of wealth, stretch in a broad belt within the aforesaid coniferous district, mainly north of the 46 degree parellel, extending northwesterly through the counties of Chisago, Isanti, Mille Lacs. Benton, Morrison, Todd, Otter Tail, Becker, Polk and Beltrami, nearly parallel to the line of the hardwood forests, as such, and crossing Red Lake River on to the north of Red Lake, thence easterly to the shore of Lake Superior at Grand Portage.

THE BIG WOODS.

The real hardwood forests of Minnesota, known as the "Big Woods," lie to the south and west of the "Pine Zone," extending north and northwest from Freeborn and Murray counties into Marshall county, to within 50 or 60 miles of the international line. This hardwood district, about 300 miles long and 20 miles wide, is the extreme western body of timber of any commercial value east of the Rocky Mountains. The surface of the land is generally level, some times undulating, well watered, particularly in the so-called "Park Region," which lies in Becker, Otter Tail, Douglas, Stearns and Todd Counties, and in fact extending through Wright, Hennepin, Carver, Le Sueur, Rice and Steel counties. The existence of this spur of woodlands extending into the prairie regions, successfully resisting the fires that annually spread over this country in former years, and effectually taming down the prairie winds from the west and southwest, may properly be regarded as a phenomenon in natural history. Its fauna is unlike that of the prairie, including the bear, wolf, deer, beaver, otter, and birds in great abundance.

THE TRANSFORMATION.

Though but a tithe comparatively, of our vast wilderness is subdued, it is wonderfully transformed. Energetic pioneers from all parts of the country and enlightened Europe, have opened it up, dotted it with farms, villages and cities, and linked them with rail-

roads and telegraphs clear to and even beyond the Mesaba Range. The pines go first, next the cedars, spruces, tamaracs, next the lindels and hardwoods. It is the fatality of our civilization.

HOROSCOPIC.

We have not yet reached the neutral line between woodland excess and defect. but are so near it the shadow of calamity is cast before, and the question turns, "What shall we do to protect the lumber industry and preserve our streams and lakes at their sources, and with them our valuable fishes, game animals and birds?" The solution becomes more difficult when we apply the necessary factor of agricultural promotion; for the people must have homes, and all our acres must be made to yield their utmost.

CLIMATIC.

Incidental to her environment, Minnesota has a climate peculiarly her own—healthful to a pre-eminent degree, pure water from her innumerable springs, electric dry air, sudden transition from winter to spring, rapid growth of vegetation, long, beautiful autumns. The average annual rainfall and snow range from 25 to 30 inches.

ADAPTABLE FLORA.

The conditions of the situation evolve a corresponding development of flora. On the rich humus of the prairie, on the cliffs of sandstone and limestone in the southeastern portion of the State, on the more sandy soil of the forested domain, on the hills of granite and crystalline schists north of Lake Superior, on the innumerable swamp lands seething with peaty exhuberance, is indeed a flora diverse as the locality warrants, abundant or scarce, just as the environment determines, which for utility, delicacy and beauty cannot be excelled in any part of the world.

PLANTS CATALOGUED.

In his catalogue, 1884, of the total number of plants in Minnesota, Prof. Winchell enumerates 1,650, one-twelvth of which consists of introduced species, belonging to 557 genera, and representing 118 families or orders. Since then Conway MacMillan, Professor of Botany in the University, adding to the list by virtue of further research, estimates that we have 1,750 seed-producing plants, 75 species and varieties of ferns, club mosses and allied ferns, 700 mosses and liverworts, 2,500 fungi, 800 algæ, 250 lichens. The work of collection is by no means finished. There are numerous species and varieties, new to science, waiting discovery "in neglected nooks, in marsh, in dense woods, cool ravines, on cliffs and hills, in streams and lakes."

INDIGENOUS TREES.

Of the 412 species. in Prof. C. S. Sargent's catalogue, of the forest trees of North America, 81 appear indigenously in Minnesota. A

mention has already been given of the principal species and varieties peculiar to the great coniferous district, conspicuously the pines. Such desiduous trees as the basswoods, maples, oaks, ashes, poplars, birches, willows, hackberries, water beeches, elms, hornbeams, butternuts, bitternuts, wild plums, bird cherries, etc., are found mainly south of the pine belt, growing in rich profusion, with such additional trees acclimated by special protection, north even of 45 degrees 30 minutes, as the black walnut, shellbark hickory, red mulberry, cottonwood, American crab apple, red cedar, etc.

VINES AND SHRUBS.

Prolific in the northeast part of the State, extending to limits approximately coinciding with the upper Mississippi, Red Lake and Lake of the Woods, and more or less companionated with the evergreen families, are such valuable vines and shrubs as the American Ivy (Ampelopsis quinguefolia) Bittersweet or Climbing Celastrus (scandens), Moonseed (Minisperum Canadense) Frost Grape (Vitaceæ cordifolia), Highbush Cranberry (Oxyoccus Erethrocarpus) and Creeping Cranberry (O. palustrus and macrocarpus) Black Huckleberry (Gaylussacia resinosa), Blueberry (Vaccinium) with large variety of the same family, Black Raspberry (Rebus occidentalis), Dewberry (R. Canadensis), Red Raspberry (R, strigosus), Blackberry (R villosus), Gooseberry (Rebus rotundifolium), varieties of the Honeysuckle (Lonicera), an dElder (Sambucus), and other vines and shrubs more or less valuable, too numerous to mention here.

GRASSES.

Of the grasses, mostly native, about a hundred and forty species and varieties are catalogued. They have more or less intermingled as if confounding latitude and longitude, carpeting the prairie and woodland openings, but yielding to the "fittest," such as the Indian Rice (Zizania aquatica) in the water-soaked bog lands, Meadow Oat Grass(Arrhenatherum avenaceum), Blue Joint (Agropereum glaucum) Northern Red Top (Agnostis exerata), Timothy (Phelum pratense), White Clover or Shamrock (Trifoleum repens), Red Clover (T. Pratense).

WILD FLOWERS.

In this limited space it is impossible to enumerate and describe them. Col John H. Stevens, President of the State Forestry Association, aided by Dr. Chas. L. Anderson, a reliable botanist, states in his report before the Minnesota Horticultural Society, 1890, that we have "800 species of wild flowering plants in Minnesota." A goodly portion of them are now gracing our many beautiful lawns. On our woodland hills and glens and swamps, what a world of them, festooned with ferns and with mosses on the decay of vegetation, on the shaded trunks of living trees, on the century rocks! And on the prairie, what a profusion of asters, golden rods, wild clovers, roses, lilies, harebells, phloxes, fringed gentians, sun flowers, geradias and blazing stars!

Water Reservoirs and Trees.

By the munificence of the national government, Minnesota has laid the basis of a great water reservoir system, which, with a corresponding development of forestry to feed it, will become one of the most gigantic and practical on the continent. Elevated 1,275 feet, average, above the sea, it has sufficient decline for all flowage purposes, and so level is its surface, compared with hilly and mountainous districts farther west and east, the water can be readily retained without the usual expense of irrigable enterprises, for the abundant growth of vegetation wherever applied.

NATURE'S UNEQUAL DISTRIBUTION.

In an able paper written for the forestry meeting, held at the State Fair, September 8, 1892, Major W. A. Jones, of the Engineers Corps, U. S., in charge of the reservoirs at the head waters of the Mississippi, said: "All vital growth is dependent upon and largely nourished by water and oxygen. The atmosphere which envelopes the earth is loaded with the latter, and hence it is, with rare exceptions, within easy reach of all living forms. But water does not permeate the environment of all living things with precision and in sufficient quantity. Not enough of it gets into the atmosphere to go round; all sorts of things interfere with its air-line distribution, and, as a consequence, some localities get too much, others too little, and some none at all.

"Of the conditions under which the air gathers it up from the surface in wet places and distributes it over the earth in both wet and dry places in the form of rain, we know some, but not many, nor enough. We knnw that the quantity of water carried away from a wet surface is a function of: (1) the temperature of water; (2) the carrying capacity of the air; and (3) of the quantity of air brought into contact with the surface in question. We know that while carried as vapor in the air, certain undefined conditions of heat and electricity will cause it to liquify and fall back to the earth's surface. But beyond this we are mostly in the dark. We can only believe what we see and foresee but a very little bit.

NOT ENOUGH TO GO ROUND.

We are thus led up to the fact that for considerable areas of land in the United States there is grave doubt as to whether the rainfall will continuously be sufficient for the cultivation of the soil. For still larger areas it is certain that the water supply is not sufficient. It is probably true that we are powerless to influence rainfall. But it is certainly true that we can, as a matter of engineering skill, imitate nature by gathering water in great reservoirs in favored localities and lead it to and over and upon the unfavered ones. I cannot too strongly accentuate the fact that this is a matter of engineering, and must sooner or later be handled by engineers.

ART OF ENGINEERING.

"The art of the engineer is to control and adapt the forces of nature, in a feeble way, to the uses of man. He is the only one in the body politic of society who has practical experience in dealing with those forces in that way. He will tell you that the handling of water is the most difficult problem of his art.

I need not expand upon the application of all this to forestry. This art has for its object the preservation of the old, the creation of the new. Wherever it goes, water is a vital factor.

A COLOSSAL EXAMPLE.

"In the interests of the navigation of the Mississippi river, the United States has established a colossal example in the conservation of water. It is rather an obvious proposition that more water will improve the navigable capacity of any river. And the greater the navigable capacity of any waterway, the greater its commercial value. But it is not generally known that this latter value increases very much faster than the former.

CAPACITY OF THE MISSISSIPPI.

"It takes, however, a great deal of water to help a river. The Mississippi, near St. Paul, requires over 3,000 cubic feet per second before it can accommodate boats drawing three feet of water. This means a little less that 2,000,000,000 gallons per day. The reservoirs are designed to furnish about that quantity of water during the period when the water in the river is ordinarily low. This period varies from sixty to ninety days, and hence the whole quantity that may be called for in a season is about 180,000,000,000 gallons. Their maximum capacity is about 675,000,000,000 gallons.

PRESENT RESERVOIRS.

"Four reservoirs are completed and in operation:

LAKE WINNIBIGOSHISH.

Watershed, 1,422 square miles.
Water surface, 110,206 acres.
Storage capacity, 344,000,000,000 gallons.

LEECH LAKE.

Watershed, 1,225 square miles.
Water surface, 110,632 acres.
Storage capacity, 225,000,000,000 gallons.

POKEGAMA.

Watershed, 630 square miles.
Storage capacity, 35,000,000,000 gallons.

PINE RIVER.

Watershed, 602 square miles.
Water surface, 15,206 acres.
Storage capacity, 56,000,000,000 gallons.

SANDY LAKE (NEARLY COMPLETE.)

Watershed, 384 square miles.
Water surface, 7,522 acres.
Storage capacity, 15,600,000,000 gallons."

THE CANALS OF BABYLON.

The Major suggests that "the fertile plains of Babylon and Tyre were on the border land of desert." Very probable, for Babylonia is a dry steppe or table land, naturally fertile, but incapable of luxurious vegetation without irrigation, as are the Great Plains.

THE WATER PROBLEM.

Estimating our average rainfall at 25 inches, we have in round numbers, 274,725,378,027,281 gallons falling annually upon our State. What becomes of all this water? According to Lieutenant Maury, the precipitation of the Mississippi river basin amounts annually to 620 cubic miles of water. The estimate of the discharge into the Gulf of Mexico is 107 cubic miles. This leaves 513 cubic miles for evaporation and soil and vegetable absorption. Calculating the immeasurable hungry mouths of our crop vegetation growing in our soils, rendered porous by culture, it is safe to say one-half of our precipitation is thus absorbed, and this percentage is augmenting proportionate to the increase of population with corresponding increase of agricultural advancement.

Knowing that by virtue of location Minnesota is the lock and key of a continental commerce, master thinkers and engineers are studying the problem, how to utilize to best advantage the mighty tides of surplus waters that gather at her watersheds, which in the spring flood the plains here and below us, leaving but ruins of property and life in their wake, sure to react, as in Babylonia, into drouth and harvest destitution.

DRAINING THE SWAMP LANDS.

A project is in agitation to drain the State swamp lands in the far north. They are now more or less overgrown with decaying black spruce and tamarac, and carpeted with mosses, reeds, cranberries, blueberries and other vines and shrubs, conserving vast bodies of moisture that feed our lakes and rivers, and are there of immeasurable benefit. But the time has come when they must be put to new and better uses without losing water supply. The claims of agriculture now take precedence. Properly drained they will make the best of farms, waiting to be subdued and occupied by intelligent emigrants. Our valuable timber trees, such as the

pines and hardwoods, cannot grow in swamps and bogs; they must have lands with natural drainage. There are enough non-agricultural lands to serve this purpose, and at the same time conserve our waters with equal facility under leafy and root-matted floors.

CANALING THE WOODLANDS.

The proposition, therefore, of canaling the native woodlands for agricultural and commercial purposes, seems very feasible, and will no doubt be eventually consummated, having at length a net work of irrigable canals extending into prairie portions of the State. No floods need then accrue. The surplus waters will be conducted into the gulches, lagoons, lakes, and husbanded over the prairies, the whole system held in reserve by the government dams to be distributed when needed for river driving and navigation as now, and farm irrigation with certainty of crops.

Native and Planted Forests Compared.

According to estimates in answer to questions sent to all the County Auditors in the State, the average deforestation by cutting and fires in the woodland, is forty per cent of the original—taking the forests as a whole; and that such clearing is about forty per cent greater than reforestation from young trees. It is obvious that this excess of clearing over the growing, if continued a series of years, will speedily run our native forests out, leaving but a wreck behind. The matter becomes the more serious to contemplate when we analyze the negation to the question, "Do the owners grow thereon (denuded lands) new supplies of pines or other valuable trees?" Not a voice from all the woods answers in the affirmative. The returns all agree, that lumber men use no concerted methods by which to prevent forest fires; that, except in the northern tier of counties where the forests remain comparatively unbroken, less humidity is observed. These exceptional counties report that the lakes and rivers there have not observably diminished, but when we drop down to about 45 degrees and 30 minutes latitude where the woodlands are largely cleared up and cattle browse the tender growth, the returns say these waters are drying up, and the cause is traced to deforestation.

THE SITUATION IN THE PRAIRIE COUNTIES.

According to returns from the prairie counties, most of which had some native trees, 75 per cent of such trees have been cut, 35 per cent more than in the great woods. Such cutting has now mainly ceased, or, rather, the growth equals the cutting, for the planted trees in the more southerly portion of the State are so large they are being thinned out for fuel, improving the forest conditions.

INCREASE OF PLANTING.

Tree planting on the prairies has generally been the accompaniment of settlement. The national centennial, 1876, demarks the era of forest culture in Minnesota. Under the practical instruction of the State Forestry Association, 7,000,000 trees were planted that year, and 26,500,000 were reported as the aggregate then growing in the fifty prairie counties. The organizing of new prairie towns, peppered with farms clear to the international boundary, and the improved methods of raising trees, have certainly augmented the Sylvan industry at least a hundred fold since 1876. Some of the older counties report that their landscapes now appear as if they were natural woodlands, so large and compact are their trees planted in groves and windbreaks.

OPERATION OF THE TREE BOUNTY LAW.

Dating in 1873, Minnesota proffers a bounty now of $2.00 per acre, successfully planted with forest trees, annually for a term of six years, and limits the annual amount to $20,000. Under the operation of this law, modified from time to time, not less than "50,000 acres of forest trees have been successfully established in the prairie regions of the State." Add to the "50,000 bounty acres" those planted under the 'Timber Culture Act," and voluntarily planted, the aggregate is most encouraging. According to the return figures, the average is 6,000 acres per prairie county, mainly of planted trees. It is safe, then, to reckon that the forests and the prairies amount in the aggregate to 300,000 acres. The work, however, is but begun. Vast, rich plains to the west and northwest of our State are yet to be civilized by sylvan shade and beauty. The new era of forestry is dawning; the "Leaf Dwellers" are beginning to feel as deep an interest in forest economy as the prairie yeomanry are to erect a forest wall against the Simoons of the Southwest.

The Reserve System.

Basing action on the congressional law of March 3, 1891, a movement, in the early part of that year, was projected by the State Forestry Association to locate a forest reserve on the public lands at the head waters of the Mississippi, Red, St. Louis, and St Croix rivers. Our legislature, then in session, passed a joint resolution to this effect, but limited its area to so small a compass as to render it abortive of the end sought. A petition, signed by leading citizens, asking for six millions of acres for a national reserve, was subsequently sent, with showers of others from other States, to President Harrison. He proclaimed six reservations in the regions of the Rocky Mountains, embracing an aggregate of over three million acres.

INCOMPETENCY OF THE ACT.

Unfortunately the law opened up to almost unrestricted use of all timber lands not so reserved. While it implied an unlooked for license to deforest adjacent territory, it virtually denied encouragement to agriculture, railroading, mining, etc., within the reservations. Summing up these defects, Land Commissioner Carter recommended that "provision should be made for the immediate reservation of all public lands bearing forests or timber, except for entry and mining lands."

The defects in the law and the crudeness of our original petition were followed by strong remonstrances against the Minnesota Reserve, and it was left out of the list of proclamations with several others like situated.

NEW BASE OF OPERATIONS.

Gaining ground by experience, the Minnesota foresters joined with those of other States, demanding a law which, as stated by Mr. Carter, "shall make adequate provision in respect to both forest reservation and the cutting and removal of timber to supply the public necessities." Finding our lumber men and other business citizens endorsed this suggestion of the Land Commissioner, our State Forestry Association has since issued the following:

PETITION FOR A FOREST RESERVE.

To the Honorable Senators and Representatives of Congress—

The undersigned citizens of Minnesota set forth that the annual fires on the woodlands of the public domain, have destroyed much valuable timber and largely injured the forest conditions necessary to economize our waters; that the stealing of timber has been immense; that the methods of cutting have been wasteful and ruinous to timber preservation and culture: We therefore respectfully urge the passage of a bill which shall ask for a practical system of forestry, managed by proper police forces to guard against fires and trespass and develop forest growth. In accord therewith, we respectfully urge that a reserve in one body, or in separate sections, be located on the public domain at the sources of the Mississippi, Red, St. Louis and St. Croix rivers, or other points, carved out of non-agricultural lands, aggregating not less than 2,000,000 acres, and so regulated as not to restrict the rights of bona fide settlers, nor the rights of lumbering, mining and railroading, but rather to promote those industries without detriment to forest preservation.

SUMMARY OF THE SITUATION.

The proposed legislation keeps in view the following principles as expressed in the Paddock Bill now pending in congress.

1. That the retention of the public timber lands in the General Government, and their administration as such, is the only proper policy for all wooded areas of the public domain which do not stock on agricultural land.

2. That only a fully developed and separate system of management and administration, carried on by competent men under expert advice, can accomplish the objects of a rational forest policy.

3. That the object of the public forest reservations is twofold, namely, to maintain desirable forest conditions with regard to waterflow, and, at the same time, to furnish material to the communities in their neighborhood.

4. That while the service of protection of watersheds would warrant an expenditure out of other funds for such service, it should, nevertheless, pay for itself by the sale of surplus forest material.

NATIONAL FORESTRY.

It will be seen that the application of these principles places forestry on a national basis, not only by Minnesota but by all the States where forests remain on the public domain. The national system is ably voiced by Hon. Abbott Kinney, of California:

"A national system would necessarily consider the forest from a wide and general view as to locality, product and time. As to locality, a national system would consider, for instance, the interests of Dakota, Nebraska, Missouri, and all the States upon the water system heading in Dakota. An individual system would not consider such interests at all. A Dakota system would only consider Dakota and pay no heed to the other States. As to product, an individual system could only consider individual interests; a State system could only consider State interests. In neither case could national or general interests be provided for. As to time: The most important forest product, lumber, requires a long period of time to come to its highest economic value. One, two, and often three or more generations must be born and die before a forest comes to maturity. This fact makes it plain that no individual system can ever adequately provide for the production of the most valuable timber, requiring scientific management covering many years of intelligent and watchful care."

Forest Fires.

As with other timbered States, Minnesota deplores her annual forest fires. Our people, with few exceptions, have accepted the testimony of our agricultural chemists, that such fires neutralize the nitrogen processes of transformation into plant life educed by moisture and decay, that they cause an undue volatization of ammonia from the soil, escaping into the air; that this dessication, if long continued, changes the soil into desert conditions, followed by a retrograde instalment of trees, and the loss of our springs, rivers and lakes.

Vandal habits of forest destruction are, therefore, beginning to be frowned upon, and he who carelessly or wantonly fires a forest, be he resident, hunter, fisherman, lumberman, tourist or railroad hand, is looked upon as a "criminal of the darkest dye—a firefiend of the forest," and should be made liable to heavy penalties for so "unpardonable a sin."

HOW TO PREVENT FOREST FIRES

The system of fire-wardens in New York, guarding the Adirondacks, has proved successful to a commendable degree. A similar system, better fortified, perhaps, is operating to good effect in Maine. Minnesota, it seems, is not yet ready to follow suit. We have so vast an unoccupied territory, it is very difficult to institute a police force adequate to the great task. Among the methods suggested, and under serious consideration with our forest promoters, looking to their speedy enactment in law soon as agreement is reached, are these:

That all railways in the State should have spark arresters on their every locomotive, kept in proper order. They do have them now.

That such authorities should, in the dry seasons of the year, clear away or burn up all inflammable substances on each side of their lines to the width of their right of way. This they do.

That, to limit forest fires within special bounds where they get the ascendency, official forces should be organized with authority to use rivers and chains of lakes, supplimented by clearing up the breaks in such natural fire-barriers.

That, as further protection, there should be constructed new highways on the section lines of the sparsely populated regions of the woodlands kept open and the grass subdued.

That the national government should employ its soldiers, during the dangerous seasons, as planned and urged by the American Forestry Association, to force the prevention of forest fires on the public domain, and co-operate with the State to the same end on all the State, school, corporate and personal woodlands.

Educational Forestry.

Prof. C. K. Adams, while president of Cornell University, N. Y., thus practically sums up the real need of the hour:

"The farmers, more than any other class, have to do with the forests; and in the education of farmers, instruction in this industry ought not to be neglected but be given a prominent place. The agricultural colleges have been established with governmental help. Many of them are solely dependent on funds derived from congressional and State grants. It would be entirely appropriate, therefore, for the national and State legislatures to insist that regular and systematic instruction in the care and development of our arboreal resources should be given in every agricultural college in the land."

In justice to Minnesota be it said, that the farm students in our Agricultural School at St. Anthony Park, numbering now among the hundreds, has a special branch of Forestry and Horticulture under the superintendence of Prof. S. B. Green. All the students of this popular school are learning to be planters and saviors of forests, conservators of waters and solid, practical farmers.

Botany classes are organized in a majority of our graded high schools throughout the State. Every one of our seminaries and academies makes it a cardinal branch of scholarship. Our University, ranking with the first in the Union, teaches it on a liberal scale.

FORESTRY IN THE LOWER GRADES.

The demand is increasing in Minnesota to have scientific forestry incorporated in the educational curriculum. Prof. B. G. Northrop, of Connecticut, speaking of university students he wots of, tersely says: "They have grown up as ignorant of the trees of our forests and the crops of our fields as a Hottentot grows up ignorant of the stars." Like specimens live out west as well as east. It is beginning to be discovered in Minnesota that scholarship without a practical knowledge of trees is a "barren thing." The question is asked in almost every part of our State, and intensifying into popular demand for the qualification, who among our common school teachers is able to quicken a zest and vigor for school work by showing the youth how to grow tiny seedlings from forest seeds, and how to distinguish the different species and varieties of trees by the structure of the seed, twig, leaf and bark?

WORK OF THE MINNESOTA PRESS.

The Progressive Age, Northwestern Agriculturist and Farm, Stock and Home, all published in Minneapolis, and Farmer and Breeder, of St. Paul, have taken the journalistic lead in awakening an interest in forestry improvement on the educational lines. In fact, every newspaper and literary periodical in the State has ever been ready to co-operate with the Forestry Association in reaching the masses with our practical information.

THE JUVENAL AWAKENING.

Following the successful example of Wisconsin, our State Horticultural Society is initiating a work to train up a generation of lovers and defenders of trees and fruit plants by offering plant prizes to the school children for membership with instruction as to methods. In this promising philanthropy our Forestry Association is an earnest co-operator.

Why Plant Trees.

1. For ornament. They add beauty to the farm and home. Life without beauty is a dead and unwholesome thing.

2. As home for birds.. Would we have birds? Then plant trees. Those children of the air are the friends of man. They are mostly insect devouring, and should be encouraged.

3. For economy's sake. They will make our waste lands the most valuable of any on the farm.

4. For health. Trees absorb the noxious grasses and live upon those which poison man. They also give of gases useless to them, but useful to us.

5. To modify temperature. Trees store up heat and give it out in times of extreme cold. They absorb moisture and give it back in time of drouth. They break the winds and stay the storms.

6. To distribute electrical forces. The treeless prairies are the regions visited by the severest electrical disturbances. Every limb and twig and leaf is a silent conductor of electricity. Prant trees to ward off lightning.

7. For shade. A friendly protection this to the farmer, to his children, and to his flocks.

8. For timber. They will abundantly repay you for your time and trouble in the way of timber and fuel.

8. For their influence on the water supply. Trees greatly increase the condensation and precipitation of moisture. They increase the rainfall and decrease the evaporation in times of drouth; they help in equalizing the rain and snowfall.

Finally, with forest protection we have better fruits, grain and grass; healthier people, flocks and herds; our lands are more valuable and our farms more enjoyable. Let us encourage the grateful presence of trees.

COL. JOHN H. STEVENS.

Timber Tests.

Forestry means something more than raising and protecting trees; in a scientific, practical sense, it also determines "in what relation the mechanical properties stand to its structure and physical conditions," necessitating a knowledge of the conditions under which tested timber is grown. This known, the forester can better learn what "kinds of timber will yield the best results in given soil and climatic conditions."

EFFECT OF SOILS.

It is apparent to every close observer of trees, that the same species and variety grown in different soils and climates, though plainly retaining their identity, are not the same in timber qualities. A rich soil with the protection of right environment may, as a rule, be adjudged as furnishing best qualities. Poor, famished soil, water-washed by the freshet, more especially where the trees are exposed to pitiless winds and storms, never develop any timber worth mechanical construction. Such trees are frequently found hollow, the fibres cross-grained and twisted, fit for nothing but firewood.

TESTING MACHINE.

There is such a demand for timber qualities for special purposes, as a railroad car or sea vessel, for instance, freighted with goods and human life at perilous speeds, the timber used is often subjected to certain tests as to capacity for resistance in any direction. This is done by "testing machines." A series of tests are used to determine the influence of different degrees and methods of seasoning. The Prussian government, now leading the world in forestry,

is experimenting on these lines in response to the demand of engineers, architects, lumbermen and scientific societies. We also have expert professors in our country who are doing the same work which, as Prof. B. F. Fernow says, "will save millions of expenditure and direct and indirect losses which the country suffers from our ignorance of the true values and strength of our building timbers."

EDUCATING TREE PLANTERS.

The experiments thus far made, though but just entered upon, are pre-eminently practical, demonstrating the necessity of educating tree planters as to soil and climatic conditions for the production of selected trees for purposed objects with a view to the best profits. In his admirable report of 1891, Professor Fernow quotes a striking passage "which opens the vista of the benefits to be derived (from timber tests) and also emphasizes the fact that our present knowledge in this respect is a state of ignorance." Mr. D. H. Burnham, Engineer of Construction for the World's Columbian Exposition, writes: "When I was appointed Engineer of Construction, World's Columbian Exposition, August 1, I found it necessary to make changes in most of the building because I did not dare to use as high unit stress in timber as was used by my predecessor, although he claimed to be perfectly safe in his strains and brought forward authorities—Trautwine and others—to prove his statements."

NEW FIELD OF FOREST STUDY.

Collating the newer and finer uses to which our trees these days are to be put, we have to acquaint ourselves with the topography of the country where they grow, even to the slant of a plain or a hill; with the latitude, longitude, altitude; with the geological formations, the mineral compositions, the vegetable mold; the moisture conditions, the shade conditions, the light conditions, the exposures, the constituents of the soil, the age, the height compared with the diameter, the time of cutting and the mode of treatment after cutting. Here is a new field of forestry study, of business in fact, that demands the special attention of the scholar, the farmer, the lumberman, the mechanic, the engineer, the legislator, to aid in the economy of forestry.

The Great Plains.

Hon. W. W. Barrett, State Superintendent of Irrigation and Forestry, North Dakota, lays down and builds around this postulate: "Whatever is in accordance with the laws of Nature, and conditions are right therefor, can be accomplished." According to this, we can be master of the Great Plains, that "empire of treeless lands," semi-arid, "extending from near the 97th meridian, west longitude, to the Rocky Mountains on the west and from the Gulf of Mexico to and far beyond the international boundary line, making an area, almost treeless, of probably not

less than 700,000 square miles." This indefatigable forester emphasizes what the rest of us advocate and believe is attainable, that these plains should be and can be timber-belted mainly from east to west by a series of great forests, with ample spaces between them for agriculture, the whole covering at least one-quarter of the land. Minnesota is deeply concerned in such an enterprise. As the winds swoop down from the eastern slopes of the Rockies, they are heated to fierceness by the sun-burning sands of the "desert places" and often blight our crops on millions of acres like so many simoons. They sometimes beat us with Borean wrath in mid-winter. We have conquered the savage, the wolf and the wild sod; can we not conquer the winds of the Great Plains and harness them up to be our beneficent servants? What the Dakotas do in this respect equally blesses us of Minnesota. Their irrigation system is the hopeful initial. Prof. Fernow, speaking on this subject, maintains the "planting in masses," as proposed, is feasible and should be undertaken with "well-directed and associated effort." A convention of American Foresters to discuss and plan the conquest over the Great Plains, is already under consideration.

Wood Pulp.

According to statistics of the wood pulp industry of the United States, 1890, there are 237 mills, having a total capacity, mechanical and chemical combined, of developing daily 4,000,000,000 pounds of pulp. In the last eight years the business has increased nearly 500 per cent. In 1888 the pulp stumpage was valued at $2,235,000; the ground product was estimated at $12,375,000. The figures also show that the present consumption of wood per annum for pulp is 1,000,000 cords. The percentage goes up with the increase of demand; and in a few years more, millions of cords will swell to billions. Couple the pulp consumption of our woods with what is used in sawn lumber and what fires annually destroy, and what will we have left at the beginning of the 20th century, unless immediate and ample arrangements are made to grow new forests on a scale commensurate with the demand?

Pulp was used first only for the manufacture of paper; now-a-days it is transformed into tubs, pails, barrels, water pipes, washboards, kitchen utensils. doors, caskets, flower-pots, horse shoes, carriage bodies, floor coverings, furniture, building ornamentations, and various other useful and beautiful structures. Indeed, textile material resembling leather, cloth and silk have been manufactured from it. It forms a protective armor to torpedo rams. Bullets for rifle use are made of it. An entire hotel in Hamburg, Germany, has been constructed from it. Food products are derived from it, also alcohol. There seems to be no end to its uses. As the soft woods contain more cellulose than the hard woods, the former has as yet the higher commercial value.

Speaking of the adaptation of our wood to pulp processes, Prof. Fernow says: "The fibers of conifers resemble those of cotton,

are of considerable length, flat, tape-like and flexible, which characteristics impart to them superior quality. * * * The poplars which have the longest fibers of those so far used, have the advantage of persistent white color, while basswood, next in value, takes a reddish tint, birch a pink, and maple a purple hue, which makes it objectionable; larch is said to color very badly. Spruce, balsam, or hemlock, jack pine, cedar in the north, loblolly pine and cypress of the south, are at present staples. The spruce especially furnishes at present the bulk of pulp manufactured in this country, a frequent practice being to add some poplar or aspen pulp for the purpose of whitening the spruce pulp."

Minnesota has a vast resource for the pulp industry. Millions of her bog lands are densely covered with black spruce, and white spruce is quite common on the higher drained lands. The latter is one of the most enduring trees of our prairies. The poplars are immeasurable, growing everywhere on the denuded districts of our woodland country, and largely sprinkled among our other timber trees. The poplar is a rapid grower with us; in fifteen years it is suitable for pulp manufacture. Enterprising men in Minnesota are beginning to improve the pulp chances. The paper mill at Little Falls, for example, is doing an immense business in this line, profitable, too, for the farmers who supply the raw material.

Arbor Day.

Minnesota was one of the first States to observe Arbor Day after the example of Nebraska, where it originated, 1872, under the administration of Gov. J. Sterling Morton. Our State Forestry Association initiated its observance in 1876, the next year after it was proclaimed by Gov. Robt. W. Turnas, successor of Mr. Morton. Approved by our Minnesota governor, Hon. John S. Pillsbury, backed by our legislature, with its first forestry appropriation of $2,500 for tree culture, great interest was evoked in all the settled portions of the prairie counties. Liberal premiums by the Association were offered competitors in tree planting. The Pioneer Press Company, the Minneapolis Tribune Company and philanthropic citizens also offered prizes. The records show that about one million trees and cuttings, a goodly share by the "Little Foresters," were planted on our first Arbor Day, May 1, 1876, under the direct auspices of the Forestry Association, led by Sec'y. Leonard B. Hodges, for prizes alone. The day has been observed every year since that splendid inauguration, copied in example by two-thirds now of all the States, also by Canada, England, France, South Africa. and some of the isles of Oceanica.

ARBOR DAY IN SCHOOL.

The application of this grand work to schools was not named at first. At a meeting of the American Forestry Association (international) held in St. Paul, Minn., August, 1882, Prof. B. G. Northrop, of Connecticut, originator of "Village Improvement Socie

ties," successfully submitted a resolution, favoring the observance of Arbor Day in all the schools of the States and Canada. Some governors and prominent teachers in different parts of the country, disapproved, but Arbor Day for tree planting, like the sun, obscured the lesser stars in its dazzle, and in less than two years the St. Paul resolution was practically endorsed, Minnesota again at the front on the "forward march." Hon. L. F. Hubbard, 1885, was the first governor who proclaimed Arbor Day under the school regime, followed in succession by Governors McDill, Merriam and Nelson, co-operated with by Prof. D. L. Kiehle, Superintendent of Public Instruction, who has rallied the schools of the State to observe the day with patriotic exercises, practically initiating a "School of young Foresters."

WOODMAN SPARE THAT TREE.

We should cluster around Arbor Day the sweetest and purest ideals and affections, till we shall all realize more fully than before, that trees are our companions in worship, our counsellors, our protectors, our inspiring helpfulness. As the all-promising anniversary returns, we cannot be indifferent to the sacred trusts imposed upon us. They who are conversant with the science of forestry should take the lead, and demonstrate by example that the law of economy on which success is based, is as applicable to trees as to business—in selection, in size, in preserving an abundance of fibrous roots, in form and vigor, in method of planting, and in after care. Let the children give pretty names to the trees they plant, and they will feel that they are theirs to love and protect, and by them to be loved and protected in return. They will thus sooner confirm themselves in habits of observation and study, developing a beautiful nobility of character. As they grow up with their precious charges they will soon command the abolition of forest vandalism.

Rural Beauty of Minnesota.

Minnesota, in Indian vernacular, signifies "sky-clouded water." Rightly named, for in her myriad lakes and rivers are mirrored the bending heavens, clean, rainbowed, starred in kaleidoscopic views. True, we have an occasional blizzard, but, snugly housed, there is a rapture in its roar and electric touch. In summer our prairies are a perfect sea of flowers. As in New England, the colors on our autumnal forests are gorgeous beyond compare. Nothing in all the world can excel in weird beauty our Minnetonka nestling in the park woods, our wild Mille Lacs, our Leech and Winnibigoshish and their interlocking lakes, our Red Lake, so like the auricle and ventricle of the human heart, our Vermillion Lake with the moss-clad islands in it, our "Lesser Alps" at the rock-bound coast of Rainy Lake River afar to the Northwest, bordering the British Possessions.

MOSSES.

A rich variety of mosses grow all over our wild woodlands and along the damp shores of our prairie streams and lakes. They cling to the rocks, hang in festoons over the water springs, climb the sandy sides of the great trees without breaking their continuity, sometimes higher than one's head—lichen flora which the haunting Naiads have planted and trailed upward with sweet persuasion. The mosses living on vegetable decay and even on the rifted rocks, suck up the moisture from the air and ground, and hold it in reserve from undue evaporation for distribution in mid-summer when most needed. How few people think of their beneficent uses! They do not pause to consider, that, in destroying the forests by axes and fires to the ruin of "God's first temples," they arrest nature's processes of vegetable resurrection, break down the capillary compensation provided for our common welfare, and thus break down our water reservoirs to the serious injury of the lumber and agricultural industries.

LANDSCAPE ARCHITECTURE.

Our country people are slowly but surely building on the prairies the counterpart of our beautiful, native woods. Why do they pattern so after the city—plant their trees in squares and blocks? This is artificial and unseemly. Mountains are clustered; valleys are winding; so the shores of the rivers, lakes and seas. We do best when we follow the art of nature—plant on the crests and slopes of hills, fringe the sloughs with pendent willows, stretch sylvan threads along all our waters, preserving them from undue evaporation. Our forests can be sufficiently compact for all practical purposes, and yet lie in curves, allowing open spaces between the encircling belts for well-protected fields and orchards, richly enhancing the picturesque variety.

LAWNS.

The lover of natural beauty will notice that a large proportion of our Minnesota homes in the cities, villages and on the progressive line in the country, have well-arranged and attractive lawns. Nothing is more charming than to study some of our clean-cut lawns, their curving lines, their grouped shrubbery, their cheerful views from all the windows, welcoming plenty of light and air. Describing our rural homes, Col. John H. Stevens happily says: "The mountain ash, the green-boughed pine, cedar, spruce, balsam and other evergreens adorn our homes, which, with ornamental shrubs, the flowering almond, the acasia, barberry, snow-ball, spireas, syringa, and holly-leaved shrubbery, make the rural life as near perfect as can be reached by most of us."

ORNAMENTATION OF OUR PUBLIC INSTITUTIONS.

The answers to a letter of inquiry in relation to the environment of our public institutions and its effect upon the moulding of character, demonstrate the deep interest our legislative representatives,

educators and municipal authorities feel in behalf of sylvan ornamentation:

Minnesota State Prison, Stillwater.—Henry Walfer, Warden, reports an unfortunate situation of the prison buildings, having no rural beauty to enliven the senses and awaken the better emotions of mind and heart. This is a serious mistake, which it becomes our legislature to rectify. There is, however, "about half an acre," says Mr. Walfer, "adjacent to our new solitary and hospital building, which I intend to ornament with trees, flowers and a fountain for the benefit of convalescent and hospital patients"

The Minnesota School for the Feeble-Minded, Faribault.—A. C. Rogers, M. D., Superintendent. A synopsis of this gentleman's happy description is this: Sixty acres campus; old forest trees standing; new ones planted; drives and walks "divide the campus into triangles and irregular areas with curved outlines; beds of flowers and foliage plants." Space forbids reporting his pen-picture of the spruce hedge, the large vase on a pedestal, the fountain with the floral in front of the building; the trees on the crest and slopes of Straight River; the town below, the picturesque landscape far away. And there are the grassy lawns "kept in order by the older boys; the greenhouse in construction; the boxes of blooming plants on the window ledges which are very handsome against their background of gray stone." The influence of this very beautiful retreat and home for the feeble-minded is reported as very salutary.

The Minnesota Soldiers' Home, at Minnehaha Falls, just out from Minneapolis.—No location in all the country for our ex-soldiers, sailors and marines, is more weird and enchanting. The campus of fifty-one acres was donated by Minneapolis in 1887, and two years after, this city, under a legislative act, obtained title to the "Minnehaha State Park," including the fifty-one acres and the famous Falls of Minnehaha. "This splendid park for all practical purposes is an extension of the domain of the home, so as to give one body of two hundred acres of finely wooded land, including nearly a mile of bluff on the river shore, and the wild and deep gorge of Minnehaha creek from above the falls to the mouth of the Mississippi."

State Public School for Dependent and Neglected Children, Owatonna.--G. A. Merrill, Superintendent, mentions the buildings on an eminence, overlooking that neat country city; ten acres campus; deciduous and evergreen trees, flowering shrubs, all under management of a landscape gardener. He adds: "We have an orchard of six hundred fruit trees, including apples, pears, plums and cherries. The State Experimental Tree Station, located on the grounds, and under the management of Mr. E. H. S. Dartt, has supplied most of these, and will probably supply all future wants in the line of fruit and ornamental trees and shrubs, free of charge. As to æsthetic advantages, proper attention to sylvan ornamentation undoubtedly cultivates a love for the second subject treated by the French philosopher, DesCartes, in his work on 'The

True, the Beautiful and the Good.' Every vantage ground should be used to uplift our children. Beautiful, well-kept lawns, decorated with trees and shrubs in proper variety; a diversified and charming landscape, are all conducive to good results in moulding character."

Minnesota Hospital for the Insane, St. Peter.—A summary of the order and beauty around this institution, as given by Dr. H. A. Tomlinson, acting Superintendent, is this: Twenty acres of lawn; trees distributed in groups, so arranged as not to interfere with the view; vines in front of the building, a few flower beds but no fountains; fine opportunities for recreation under the protecting shade; cut flowers from the green-house distributed through the house from time to time. "The æsthetic advantages of our surroundings are very great, and make the grounds of this institution the most attractive place in the neighborhood."

State Reform School, Red Wing.—This important institution has the State endowment of 450 acres, fifteen to eighteen of which are consecrated to ornamental purposes. Superintendent J. W. Brown, speaking of the silent and uplifting influences of landscape gardening, writes: "We believe in the beneficial effect of cheerful surroundings on the character of children; for this reason we intend to make the Reform School grounds one of the most attractive spots in Minnesota. We have one of the most favorable locations that could be found, and hope, in time, so to improve it that no private or public grounds in the State will excel it in beauty."

Second Hospital for the Insane, Rochester.—Arthur F. Kilbourne, Medical Superintendent, furnishes an interesting catalogue of the sylvan ornamentation and floral decoration that environ this institution: Nineteen species and varieties of deciduous trees; thirteen of the evergreen families; twenty deciduous shrubs and vines; thirty or more perennial and biennial flowers. The pleasure grounds alone contain about fifteen acres. The patients also have the benefit of beautiful groves outside of this more cultivated area. Prof. Kilbourne, speaking of the salutary influences of such association, says: "We are doing what we can to make the surroundings of this hospital pleasant to our patients. In the summer time we aim to keep them out of doors on the lawn and under the trees as much as possible."

Third Minnesota Hospital for the Insane, Fergus Falls.—Geo. O. Welch, Superintendent, reports of this young institution: "We have several thousand trees in our nursery, and hope in a few years to make some show of them about our grounds."

The University at Minneapolis.—Prof. N. H. Winchell, State Geologist, giving an interesting description of the campus in a vein of playful sarcasm about the encroachments of the artificial upon the natural of this classic elevation, thus summarizes the aboriginal attractions that "center in or cluster about the grounds:" The undulating upland surface of the whole plot; the Mississippi" river along the western bounds of the campus; the rippling brook of clear water crossing the grounds, passing between the buildings;

the Falls of St. Anthony in full view, with its rapids and lower cascades; natural, orchard-like growth of burr oaks; the historic beauties and recollections." Lest a soulless art may yet obliterate all traces of "the seductive little by-paths," and their happy reminiscences, he urges improving the manifest chances: "The paving with cedar blocks, or with asphalt, of the streets encircling or intersecting the grounds; the restoration of trees in the vacancies where those set have died, and the protection of those that have not died; the distribution of native shrubs and vines in appropriate places throughout the grounds; the laying out of walks and drives about the buildings and all over the grounds with fountains of water and artificial lakes."

The Experiment Station at St. Anthony Falls is very beautifully located among the native oaks and newly planted trees, vines, shrubs, flowers and fruit plants from world-wide latitudes—a model school, a model farm, with the æsthetic of arboriculture.

State Normal School, Moorhead.—Prof. L. C. Lord, President: "Six acres in our grounds; * * about 400 trees; no fountains. Our institution is new.

State Normal School, St. Cloud—Prof. Joseph Carhart, President: "The natural possibilities of our campus are very great, and the educational influence of such beauty is difficult to estimate."

State Normal School, Mankato.—Prof. Edward Searing, President, gives a graphic description of the campus of this school, covered with elms, basswoods, oaks, butternuts, hard maple, etc: "A more perfect and beautiful lawn cannot easily be found. * * Fountains, gravelled walks, flowers and vines are yet in the future. The beauty now is wholly in the contour—trees and grass. The ornamentation was planned by Prof. Cleveland, of your city. We secured his aid in the conviction that tastefully ornamented and well-kept grounds about our school are important adjuncts in moulding the character of our students."

RAILROAD ORNAMENTATION.

The author addressed a letter to the General Superintendents of all the railroads in the State, asking to what extent their companies have planted trees along their lines. The Minneapolis, St. Paul & Ste Marie has planted some. The Duluth & Winnepeg, though in a timber country, is "growing evergreens around the station houses." The St. Paul, Minneapolis & Omaha "has planted trees at many points in Minnesota and South Dakota, according to the apparent requirements in the case." In the early history of the Northern Pacific that company attempted forest culture along its lines, but the work was not rightly done, and the trees all died. It does not take long to convince a progressive man that "the plowing-in process right in the prairie binding-grass is a tree abortion." Twenty years ago the Great Northern, under the direction of Leonard B. Hodges, assisted by William Somerville, "planted trees along the line of Breckenridge Division, for the purpose of protecting our cuts from snow. These trees have been taken care

of and make a very efficient snow break. Trees have not been planted about depots to any great extent."

CITY PARKS.

St. Paul parks are fitly located in various parts of the city, very tastefully arranged, beautiful for trees, flowers and fountains —free for all to rest therein. Como Park is becoming a charming retreat. For miles below the city, on both sides of the Mississippi, it may properly be called one continuous park. In summer and early autumn the water expanse is covered with innumerable skiffs like so many blooming lilies, and all those umbrageous woods are verily haunted with people, happy as the birds that sing to them.

The Minneapolis Park System.—Though comparatively young, it commands universal admiration. The parks in the city real, are pretty as they can be; those in the suburbs are on a scale of vastness and grandeur. With the magnificent boulevards leading out to the Falls of Minnehaha, Lake Harriet, Calhoun, and other lakes, connecting with Minnetonka along the windings of its numerous bays, the city now owns 1,476 acres, serving as "breathing places" for its people.

Parks and Parkways of Duluth.—This young and enterprising city of grand proportions and environment, already has 145 acres of land dedicated for park purposes. About half a million dollars constitute its present investment. The Park Board of Commissioners has also under control 7.27 miles of parkway, including a loop around the mountain at Central Park, of one mile in length. The Duluth park system is unique, and destined to be a rival of the best in all the Northwest.

Winona.—Edward Lees, Secretary Board of Trade, reports a "fine semi-public park about the State Normal School building with walks, shrubbery and fountain"—otherwise made attractive for floral arrangement. Three well-wooded parks in open squares of the city. One along the levee of the Mississippi, that is to be "the handsomest place in the city;" and a suburban park on the south shore of Lake Winona, having "beautiful walks and driveways."

Little Falls.—D. N. Richardson, Mayor, reports: "Like Minneapolis, our city is divided by the Mississippi, leaving a park on each side; the eastern, once an island, is very beautiful for its forested box elders, soft maples, elms, ashes, basswoods. The western, on Pike Creek, is destined to be equally, if not more attractive. These parks are conducive to the general health and pleasure of our citizens."

Litchfield.—John Rodange, Mayor, reports that twenty years ago there was not a tree on the town site; "now the city is one vast park, having a variety of trees grown to a height of twenty to forty feet." Litchfield has four parks, a beautiful fountain, one bordering Lake Ripley, containing forty acres, with a boulevard clear around it—a most charming spot.

Rochester Park System.—A graphic writer tenders a pen-picture of this progressive city, happily mentioning its location in the bed of an ancient lake, the long-lived soft maples, elms, lindens and young trees of many species, its well-kept lawns, three public fountains, two beautiful parks. "Public squares," says this admirer of landscape gardening, "these well managed, are useful in cultivating a love of the beautiful, but the stimulus is slight compared with that of private lawns, made radiant by the care of the owner and the free use of water, without either of which success would be impossible."

For the want of space it is impossible to report any more. Suffice it, that all the cities of Minnesota, and also the villages with few exceptions, have like ornamentations within and around them. The interest in sylvan beauty is constantly augmenting. It characterizes most of our High Schools and not a few of our Common Schools. Our churches, too, are in touch with the floral inspiration; its fragrance ascending as "incense of praise."

History of the Forestry Movement.

The first steps taken in Minnesota respecting forestry was during the session of our legislature in 1860. Col. John H. Stevens, of the Senate, and D. A. Robinson and H. G. O. Morrison, of the House, were leaders The war of the rebellion breaking out, the work stumbled until 1870, when Leonard B. Hodges, courageous and self-denying, like the prophet of old, "breathed upon the dry bones," and lo, a tree-resurrection! Among their coadjutors were Pennock Pusey, L. M. Ford, G. W. Fuller, Geo. L. Becker, W. R. Marshall, C. Y. Lacy, Wyman Elliot, Dillon O'Brien, J. W. Bishop, Herman Trott, K. N. Giteau, J. C. Braden, Ignatius Donnelly, H. Austin, F. R. Delano, H. H. Sibley, R. W. Johnson, S. P. Folsom, Chas. E. Flandrau, D. W. Ingersoll, J. Fletcher Williams, W. P. Murray, C. D. Gilfillan, Lane K. Stone, H. M. Rice, and a hundred or more equally earnest.

The pioneer foresters appreciated the necessities of the situation. Mr. Hodges thus outlined it:

"So sparsely supplied with native forests only a few were the first settlers who could secure any whatever for their wants. The rest were put to great straits to secure even fuel. Fencing was almost out of the question. Lumber for the most necessary wants had to be transported great distances, at corresponding cost. While on the bleak prairies the poor settler had not so much as a shrub to break the force of the violent storms of arctic cold and blinding snow which frequently swept over the prairies, and in which often not only cattle, but even human beings perished. Under such a state of affairs, the settlement of many of our western counties would be greatly retarded, and even many of those who had already made homes there would be discouraged and tempted to emigrate, unless some protection could be provided from the severe storms, and the bleakness of the prairies be modified by groves of trees."

The pen-picture of the real was not overdrawn. Men and women, too, resolved to mitigate the dreariness of the situation by

covering a goodly portion of the prairies with trees. Failures but fortified their determination to conquer. One, two, three years, and the wild landscape was slightly forested. Emboldened by the promise of success, they appealed to the legislature. They drafted the Tree Bounty Act, which became a law. Under its donations the southern half of Minnesota's prairies showed signs of sylvan protection to the struggling settlers.

1876.

The forest victors, following up their advantage, organized the Minnesota State Forestry Association. It being recognized as a State institution, those solid men discussed and formulated the forestry problems and their kindred industries. It headed the column of agricultural improvement, paving the way for a foothold to horticulture. To this organization is the whole union of States indebted for the congressional forestry laws, beneficent in their time, comprised in the Timber Culture Act, number of trees per acre to secure a patent, extension of time on the homestead, and other measures to encourage permanent settlement of the west and planting of trees. It took the lead in fact in every practical State movement designed to protect and benefit the just interests of the farm toilers.

STATE APPROPRIATIONS FOR FORESTRY.

Up to 1891, the legislature appropriated $12,000 in all to support the beneficent work of the Association, and the interest now evoked gives assurance of continued support. In 1883, Mr. Hodges died, and the balance of the $5,000 appropriated that year was turned over to the revenue, there being no one to fill his place and legally draw out the money. But there was no going back. The splendid example of the departed secretary was indelibly registered. The association lived to see brighter days. Minnesota has also paid liberally on tree bounties—not less than $100,000 up to this date.

The presidents of this association in their order have been Hon. J. F. Drake, Hon. Ignatius Donnelly, Gen. Geo. S. Becker, Ex-Gov. W. R. Marshall, Col. John H. Stevens, and the secretaries—Pennock Pusey, Leonard B. Hodges, J. Fletcher Williams, C. L. Smith, J. O. Barrett. The forestry literature distributed by the several administrations has been immeasurable.

In Scandinavia, where the preservation of the forests is regarded as of vital importance, the laws against setting them on fire are very severe. Any person who may have caused a forest fire, whether by "accident" or otherwise (no accidents being recognized in connection with this matter), is held liable for all he is worth toward making good the damage, and he is imprisoned besides. Under these circumstances forest fires are very rare. The climate of Scandinavia in summer is more damp than ours, and lightning is less frequent, so that strict forestry regulations are more urgently required with us.

Practical Methods of Tree Planting.

Let us follow nature in seed selection and preservation. The indigenous are "the fittest." It is a thankless task to manage cottonwood seed. Better gather its seedlings from the river bottoms. Those of the elm and soft maple ripen in June. Sow them immediately. The pioneer trees are the ash, the box-elder and the hackberry, the soft maple, each in its order; not forgetting the willow, American and Russian, the cottonwood, the honey-yielding basswood. Nature knows how to care for her darlings. When the autumnal seeds of her pioneer trees fall to the ground, she covers them with a carpet of leaves for safe wintering. "Go thou and do likewise." Sow them in November on a ground bed smoothed with a rake; if leaves are not convenient place chaffy straw or boards over them, and let them stay frozen and undisturbed till spring planting. Or mix them with sand put in sacks and hang them up in the cellar. The refractory sort, such as the ash and box-elder, can be safely kept in a cool, well-ventilated place, an open shed, say; but when so treated they must be soaked in the early spring in running or frequently changed water till well swelled out for planting in moist soil.

HOW TO PLANT THE SEED.

Needs it be told it is a paying economy to have your own nursery; that the practical farmer never thinks of raising a crop of cereals or vegetables without a crop of trees to protect them; that a forest-protected crop gives at least a quarter more yield than one raised under equal culture on the open, wind-swept prairie? Be in earnest, then, in this forestry business. Prepare your soil as for corn. Sow in drills, reasonably thin, and cover about an inch. This is your seed crop whence to transplant. The nut seeds, such as the oak, the butternut, the walnut, the hickory, must be planted in the fall where you want them to stay. Cover about two inches.

SEEDLINGS.

If you have to buy, trade with a reliable nurseryman, and pay a good price for the genuine—the northern grown and well managed. Do this in the fall. When the trees arrive, cut the bands; thin out in trench after trench shingle fashion; cover nearly to the tips, and see that the ground is moist around the roots. Plant in the spring just when the ground is well warmed up and moist. Avoid exposing the roots. Sink the precious candidates down about two inches lower than they grew. Spread the roots out natural. Press down gently but firmly. Cultivate briskly till the middle of July as a rule.

PLANTING EVERGREENS.

For wind-breaks—and they are the best—plant for two or three rows, eight feet apart, so that every tree shall be opposite the space in the next row. Do you need a hedge? Of course, of

hawthorn or buffalo-berry or arbor vitæ, and that should be at least two rods outside the shelter belt. Do not have any of these rows too near the orchard. Apple and all other fruit-bearing trees and shrubs pray for good ventilation. It is well to scatter here and there an evergreen among them. Choose the nursery grown, three or four years old. Never expose the roots a single moment to the sun or drying wind.

HOW TO PLANT.

Plant all evergreens in the spring; in with them deftly, same as you do with all other plants. Water well at first, if the ground is dry. Put the roots down secure against all swaying winds. Leave a film of unpressed dirt on the surface; mulch broad out from the trunk. Keep out weeds and binding grass. Never dig deep among the roots. Stop cultivating in July, as before stated. Thus you have improved the healthfulness and beauty of the world we live in, and possess "treasures in heaven.

Lumber Interests.

Pine lumbering in Minnesota has been the prime factor of rapidly peopling this part of the Northwest. The first saw mill, used for the United States garrison, at Fort Snelling, was erected in 1821, at the falls of St. Anthony, the great Mississippi water power of the present city of Minneapolis. From the start this city has been the main center of the lumber industry. The year demarking the improved methods on a scale of vastness, is 1870. The production of lumber by the Minneapolis mills alone, dating in that year and ending in 1892, is estimated in round numbers, at six billion feet, board measure. It will exceed half a million this World's Fair year. Though this city still holds the vantage ground, there are lumber operations in all available parts of the State, Duluth being a strong competitor. "The tendency of all productive industry to centralization for purposes of economy and effectiveness is especially noted in the manufacture of lumber." Though we have, according the statistical returns, about 330 mills, large and diminutive, in Minnesota, but few comparatively do the business. Practically our lumber interests to-day are under the control of three or four great capitalistic corporations. It is estimated that not over 25,000,000 feet of the standing pine are now owned by lumbermen outside of these corporations. There are large quantities of pines on School and State lands, the stumpage of which the independent lumbermen buy; and the order and rule everywhere are to "take everything clean, sound and defective, counted in just scaling." Fire has the rest.

PINE TIMBER STILL LEFT.

The main body of the pines yet standing lies north of the Northern Pacific railway; south of it are scattered tracts, but fast receding under the increasing demand for lumber. The aggregate in solid feet of the pines still left to supply our markets, is variously estimated, some putting it as high as twenty billions. There

is no possible way to measure here with certainty. Conservative men put it at thirteen billions in the several timber districts known as the Hastings, Red Wing, Winona, St. Croix Valley, Duluth, St. Paul and Duluth railroad and Red River.

LUMBER EMPLOYES.

It is estimated that 800 men are employed in the pineries of the Mississippi waters. It takes, on an average, thirteen men to the million feet to get the logs. The exact figures of the cut in the mills last year, including shingles, are 1,344,000,000 feet. According to this data. then, the number of men employed in the woods was 17,472. Add 10 per cent for increase of business over last year, and the figures stand 19,220 men for the whole State in the winter of 1893. It takes twelve men to the million for the manufacturing and delivery of the lumber. The wages paid to work hands exceed those of the agricultural industry, averaging, in the woods this year, $29.50 per month and board; and at the mills, $2.75, self-boarding, per day.

HOW LONG WILL THE PINES LAST?

Among the principal mills, operated by the great corporations, are those of Minneapolis, Duluth, Winona, Hastings, Stillwater, Little Falls, Brainerd. Carlton, Cloquet. The upright and circular saws in board-making are giving place to the band saws, that speed as with the teeth of lightning, eating up the forests a thousand times faster than when we were boys and girls. The business is power indeed, eclipsing all other industries. What is done in Minnesota on this line is an index of other lumber States. The aggregate value of the wheat crop is but a third of the annual product of the woods. Summarize the value of all the stone quarries, petroleum resources, steam boats, sailing vessels, canal boats, and it is less than the annual value of the forest product of the nation. Put together the gross incomes of all the railway and transportation companies, and yet they come not up to the lumber of the States. The product of our woods in dollars and cents applied to-day, would more than wipe out the entire public debt. Is this mighty product diminishing? Yes, at the rate of 40 to 50 per cent greater than the reforestation. Must Minnesota step down with her sister States? Yes, if the extinction of her pines is that step. How long will her pines last? Ask the insatiate markets; ask the axes; ask the band saws; ask the consuming fires. Date from the highest figures—20,000,000,000 remaining in the wilds of Minnesota--2,000,000,000 cut per year; how long? Ten years, and the last timber pine is sold! But the conservative estimate is safer. How long? Ere the twentieth century has dawned, the legacy we have inherited cannot be transmitted to our immediate successors. It is not pleasant to contemplate. But Minnesota is not forgetful of her public trust. Her mandate is, "reserve something—economize the cut—exclude the fires—grow new instalments of valuable trees on all the waste places!"

Our Prairie and Forest Birds.

There is probably no Northern State in the Union that is so well peopled with birds as Minnesota. The prairie chickens stay with us all winter, housing themselves in the wooded ravines and straw stacks. The partridges haunt our woodlands through all seasons. Millions of wild geese visit us every fall, coming down from the north with their full grown broods. In the spring, summer and early autumn, the flower-teeming prairies and woods are all alive with birds from the "Sunny South," singing, courting, nesting, rearing their young.

INSECTIVOROUS BIRDS.

It is estimated by reliable ormithologists, that a parent insectivorous bird will daily destroy about two hundred insects, and that two old birds with five young will destroy in the process of a single day's feeding 700 insects. Multiply this number by the great multitude of insectivorous birds in the fields and woods of the country, and we can get an approximate estimate of the helpfulness of our birds in protecting our forests and agricultural interests. Think of the ruthless destruction of our robins; because they like cherries and other fruits men shoot them. Sensible horticulturists are learning the value of these beautiful visitants to our homes, and purposely provide food for them in extra amounts of bird cherries. One single young robin in its nest must have animal food greater even than its own weight; and the parent birds, if not cruelly killed, industriously gather the insects that prey upon our plants. There are millions of pairs of robins raising two or three broods a year; taken together what a benefaction they are! Yet men slaughter them without mercy. Our prairie chickens, quails, plovers and snipes are often killed just for the fun of it. They are not wholly granivorous, on the contrary they capture in wheat stubbles and corn fields more insects than they do grain. Credit the martin, oriole, bluebird and other friendly varieties. Credit the woodpecker. Boys stone it, hunters shoot it in sport, even while pecking at the tree trunks in search of borers and other insects. It does no harm, on the contrary, saves the tree from premature death.

THE WARBLERS.

And what shall we say of our warblers? Dr. Elliott Cones, a reliable ornithologist, comes to their rescue:

"With tireless industry do the warblers benefit the human race. Their unconscious zeal plays due part in the nice adjustment of nature's forces, helping to bring about that balance of vegetable and insect life without which agriculture would be in vain. They visit the orchard when the apple and pear, the peach, plum and cherry are in bloom, seeming to revel carelessly among the sweet scented and delicately tinted blossons, but never faltering in their good work. They peer into the crevices of the bark, scrutinizing each leaf, and explore the very heart of the buds, to detect, drag

forth and destroy those tiny creatures, singly insignificant, collectively a scourge, which prey upon the hopes of the fruit grower and which, if undisturbed, would bring his care to naught."

A BIRD GOSPEL.

Oh, for a bird-gospel preached in all our pulpits, and taught in all our schools, and published in all our presses! There is no room for self-praise about our Christian or advanced civilization, so long as it is popular to recklessly destroy our forests and the song birds that people them and our meadows and grain fields and gardens. Prof, Samuel Aughey, who knows all about bird habits and bird needs, thus defends them:

"It is remarkable that in the last quarter of the nineteenth century there should be such large numbers in the most enlightened countries in which the savage spirit survives. For shooting wild birds, often maiming and crippling them, inflicting on them the acutest torture, is no less cruel and brutal than the cock fighting of Spain, and the bull and other animal contests of imperial Rome. In many respects it is much more cruel. Birds have a very highly organized nervous system and must be keenly susceptible to pain. Almost everything they do indicates this. Their quick movements, their marvelous ærial evolutions, their attachments, their maternal instincts, their evident enjoyment of the beautiful, and the wonderful powers of song that many possess, all attest their high physical organization and prove the greatness of the cruelty that would ruthlessly deprive them of life. The surprise is greater when we reflect that some men of education, and in other respects of high character, indulge in the so-called sport of shooting innocent birds. It may be sport, but is it not the sport of a barbarian and the enjoyment of a savage? No doubt future ages will look on the wanton killing of birds in this period with the same surprise and disgust that we feel on reading the stories of the animal contests in the Roman arena."

Do not try so savagely to exterminate the prairie rose bushes. They do not bind like grass or weeds; their roots run down deep into the soil, serving in one sense as capillary mediums by loosening up the ground; they shade well under the hot sun; they trap the snow in winter and hold it back from melting too early in the spring; they stand the drouth remarkably well. On the unsubdued prairie they pave the way for the introduction of improved plants, and should be encouraged on the arid plains. Their flowers too are beautiful. Blessings on the wild prairie rose (pubescens).

Perhaps it is ordered that the race shall destroy forests forever, and never restore forests. The Holy Land, all the desolate Orient, once glorious in forests, luscious in fruits and fragrant in flowers, recites man's improvident and wicked waste of trees. The lesson should teach America. It, when translated to the under.

standing, is only a picture of our future if we also destroy, seldom conserve, and never plant great forests. What came to the axe-men of the Orient will come to those of the Occident. The same causes give inexorably the same results. * * * It may be that the life of a race of men is limited by the duration of the forest or woodland area which they encounter at the beginning of their career.

J. Sterling Morton, Secretary Dep't of Agriculture,
Originator of Arbor Day.

Trees growing in closeness furnishing the timber material, are very apt to be defective. They have to climb high at the expense of the roots to reach the light; such roots spread out largely on the surface, rather than dip deep, and are, of course, as scanty as their foliage. By virtue of numbers they mutually support each other with a comparatively feeble hold in the ground. The natural competition for soil sustenance educes decaying conditions as a rule. Hence the need of "axe culture," so to speak, cutting out the defective trees for fuel, leaving the "fittest" ample room and soil supply with proper pruning to develop the best qualities of timber. This woodland regeneration will never be accomplished until the forests are supervised by the government with scientific management.

We have inherited a land rich in natural fertility, with leafy groves, bubbling springs, running brooks and verdant valleys. Let us not be so greedy for the dollars as to rob our fields of their fertility or forests of their trees, and so contribute to the drying up of springs and brooks, bringing cyclones and blizzards, drouth and cold, and bequeathing to our children a barren, uninhabitable desert. We can leave behind us no nobler monuments than trees and groves. If we multiply these, our lands will be more fertile and fruitful, the winds less harsh, our homes more beautiful, and future generations will arise to call us blessed.

C. L. Smith.

On the hillsides where the soil is exhausted the best way to restore its fertility is to plant trees and allow the leaf mould to accumulate in thick layers. In the course of eight or ten years the fertility of the soil will be nearly restored, and a profit may be made from the land by cutting the trees down gradually.

Ten years ago the woodland surface of Great Britain was 2,458,000 acres. By 1888 the area occupied by timber had risen to 2,561,000 acres, and now measurements taken at the close of 1891, show a further advance the area being 3,595,000. It would be interesting to know when the United States will begin to report an increased acreage of forests from decade to decade, instead of the wholesale and vandal-like destruction that is now the universal rule.—Farm, Stock and Home.

Farmers' Institute.

This portable school, under the superintendence of Prof. O. C. Gregg, assisted by a practical corps of co-workers, is doing much for forestry at its institute sessions. Forest as well as fruit culture is included in its curriculum, educing conservative progress where it is most needed.

School For the Deaf, Faribault.

This benevolent institution has about fifteen acres campus, orderly arranged with ornamental trees, flowers and shrubs. Superintendent J. L. Noyes lays down this hygienic law in sylvan culture: "Trees should not be planted near enough a house to keep out the direct rays of the sun. Plants do not thrive well in the shade, neither is it conducive to the best health of children to be kept in dark secluded rooms. * * * Our deaf children enjoy very much the pleasant and neatly kept grounds in front of our buildings, and take interest in learning the names of trees, plants and flowers; and from what they see and learn here, I have occasion to know they carry to their homes, and there, in their own chosen way, try to follow out our illustrations before them on our own grounds."

A Model Grove and Wind Break.

The following plan for planting a grove on a prairie farm has been the most satisfactory of any yet devised. "How can I plant trees to prevent snow from drifting around the farm buildings," has been a common question among the pioneer prairie farmers. This design is intended to answer that question. Of course the plan can be varied to suit the location of buildings, roads and lay of land; but in a general way the main features of the plan should be followed.

Two rows of white willows around the entire place.

These should be four feet apart and the cuttings should be set only one foot apart in the rows.

Then an open space two rods or more in width to catch the snow, then two more rows of willows like the first, then evergreens eight feet apart in rows eight feet apart, the trees alternating so they break joints instead of coming in regular squares. Trees set in this way break the force of the wind better than a solid row, the object of the solid row around the outside being for the purpose of catching and holding the drifting snow. The main body of trees after the rows of evergreens should be some rapid growing deciduous trees like soft maple, box elder, or white ash. Where convenient the larch or walnut may also be planted. These should be planted four feet apart in rows six or eight feet apart. They should be well cultivated, no weeds or grass being allowed on the ground until the trees are up large enough to shade, so grass or weeds will not grow. Put an extra row of evergreens around the garden and along the west side of the barn-yard; also a double row between the house and barn.

Start a little nursery of evergreens in the garden, at the same time the willows are planted in the outside rows, then when the willows are large enough to shelter the young evergreens they are ready to move from the nursery to their permanent place. The "Forest-Tree Planter's Manual," published by the Minnesota Forestry Association, Minneapolis, gives detailed instructions how to prepare cuttings, plant seeds, and to transplant and cultivate trees.

C. L. Smith,
Editor of Minneapolis Weekly Tribune

(SEE OPPOSITE PAGE.)

BARN & YARD
Evergreens.
Evergreens.
GARDEN
Double row Evergreens.
N
W
E
S
Evergreens.